Report of

Michael J. Moore

Costco Wholesale Corporation v. Roger Hoen, et al.

No. CV04-0360P

July 1, 2005

I. Introduction

A. QUALIFICATIONS

1. My name is Michael Moore. I am a Managing Director with Huron Consulting Services, LLC, 550 West Van Buren Street, Chicago, Illinois. I am also the Bank of America Research Professor at the Darden School of Business, University of Virginia, and a Professor of Health Evaluation Sciences at the Medical School, University of Virginia, a Research Associate in the Health Policy and the Health Economics Sections at the National Bureau of Economic Research, and a Visiting Professor and Donald Bren Scholar at the Bren School of the Environment, University of California-Santa Barbara.

2. I received my Ph.D. in Economics in 1984 from the University of Michigan. My professional career has been devoted to research, teaching, and consulting in applied microeconomics and econometrics. I have served on the faculties of the University of Virginia, Duke University, INSEAD, and the University of California-Santa Barbara. In 1998-1999, I was the John M. Olin Fellow in Law and Economics at the George Stigler Center at the University of Chicago. I was awarded the inaugural Kenneth Arrow Award for the best paper in health economics in 1993, for my paper (written jointly with Philip Cook) "Drinking and Schooling." My research has been funded by the National Institutes of Health, the National Institute on Alcohol Abuse and Alcoholism, the National Science Foundation, and the U.S. Department of Veterans Affairs. Exhibit 1 contains my current curriculum vitae.

3. My expertise in this matter lies in my knowledge of the economics of alcohol control policies.

4. The opinions I provide in this report are based upon my knowledge, research, experience, training, education, and information and data available to me at the time that I rendered these opinions. I may use any or all of the documents that I relied upon for this expert report to explain or support the opinions I may offer at
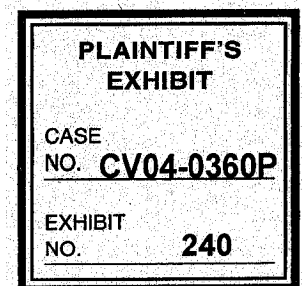
trial in this matter. I reserve the right to update my opinions as new information becomes available.

5. Exhibit 2 summarizes my recent testifying experience. Exhibit 3 documents materials that I have relied upon in forming my opinions. Huron is being compensated for my work at the rate of $600/hour.

B. ASSIGNMENT

6. I have been asked by counsel for Plaintiff Costco Wholesale Corporation to offer my expert opinion in response to the expert report of Professor Frank J. Chaloupka in the matter *Costco Wholesale Corporation v. Roger Hoen, et al.* In this regard, I have been asked to address whether it has been shown that the Washington regulations cited by defense experts, in particular Professor Chaloupka, (1) reduce abusive or excessive alcohol consumption or (2) further the State's stated desire "to promote the public's interest in fostering the orderly and responsible distribution of malt beverages and wine towards effective control of consumption; [and] to promote the fair and efficient three-tier system of distribution of such beverages."[1]

C. BACKGROUND

7. In what follows, I will compare the "actual world," which represents the status quo, to the "but-for" world, which describes what the market might look like in the absence of the challenged regulations. The but-for world will be the hypothetical situation in which the regulations at issue are eliminated and market forces are allowed to adjust prices and consumption levels for alcohol beverages in Washington.

8. I will refer to the current alcohol control regulations at issue in this matter, which Exhibit 4 summarizes, as "the challenged regulations." I will also distinguish between "normal," "abusive," and "excessive" consumption.[2]

9. An extensive literature examines various dimensions of the relationship between alcohol consumption and price. Aspects measured include quantity (number of drinks), frequency (number of drinking occasions per period), prevalence (whether one has had a drink in the relevant period), and intensity, or "binge" drinking (typically defined as the number of times per period one consumes five

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[1] Revised Code of Washington (2005) Section 66.28.180, ¶1.

[2] The distinction between normal and excessive consumption is not clear. Excessive consumption could mean "higher than average," or "high enough to do harm," for example. The meaning of "abusive" consumption, which corresponds closely with harmful consumption, is less ambiguous. "Problem drinking" is defined technically using the DSM-III criteria (Hasin, *et al.* (1996)). As defined, problem drinking corresponds closely with notions of harm and abuse.

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or more drinks).[3] The received view is that prevalence, frequency, and quantity are negatively related to price. The evidence on harmful, excessive, or abusive consumption (proxied by intensity) is more equivocal. Some published research argues that abuse and price are significantly negatively related, while other research suggests there is no significant relationship.[4] Still other researchers suggest that the evidence is mixed: there might be a relationship between price and abuse, which would be consistent with a role for taxation, but there might not. Most of the evidence that tends to question the role of price has appeared relatively recently.[5]

10. One relevant finding is that drinking and abusive drinking both are inelastic with respect to price.[6] That is, a 10% increase in price will bring about a less than proportionate (<10%) decline in drinking.[7]

11. A second literature, at least as extensive, documents the effects of alcohol consumption, in all of its forms, on health.[8] Drinking can be beneficial by reducing the risk of cardiovascular disease; it can be a benign part of a meal or a social occasion; or it can be harmful in a variety of circumstances. The latter include the effects of alcohol consumption on traffic safety, violent crime, fetal development, diseases of the heart and liver, and breast cancer.

12. A complete analysis of the issues underlying this matter requires an understanding of what, if any, aspects of the public health alcohol control policies should seek to

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[3] Measurement issues pervade this literature. For example, binge drinking as defined in the text can have different inebriation effects and implications depending upon gender, weight, and context (*i.e.*, is the drinking done in private, behind the wheel of a car, and so forth).

[4] For evidence consistent with a negative relationship between price and abuse, see Cook and Tauchen's (1982) paper examining the relationship between cirrhosis mortality and liquor taxes, and any of the numerous papers examining the relationship between price and outcomes related to abuse, such as alcohol-involved highway fatalities (Chaloupka, *et al.*, (1993)), unprotected sex (Hingson, *et al.* (2003)), Markowitz, *et al.* (2005)), and violence (Cook and Moore (2000)). For published research that fails to find a clear link between price and heavy drinking, see Manning, *et al.* (1995), Kenkel (1996), Dee (1999), Dee and Evans (2001), and Cook and Moore (2001).

[5] Manning, *et al.* (1995), Kenkel (1996), Dee (1999), Dee and Evans (2001), and Cook and Moore (2001).

[6] Elasticity is the economist's standard measure of the responsiveness of a variable "y" to changes in another variable "x." Elasticity measures the percentage change in y for a one percent change in x. The response of y to x is *inelastic* if it is less than proportionate, and *elastic* if it is more than proportionate. Elasticity measures are used because they possess certain desirable properties: they do not depend on the unit of measure and they are comparable across different outcomes. Thus, one can compare the effects of a 10% increase in price on drinking and heavy drinking using elasticities. As noted later in this report I and other experts in this case use the elasticity estimates reported by Leung and Phelps (1993) of –0.3 for beer, –1.0 for wine, and –1.5 for spirits. Thus, sub-categories of demand can be elastic, as evidenced by these estimates. Using ethanol consumption for beer and wine in Washington from 1970 – 2002, I estimated a consumption weighted average elasticity for beer and wine in Washington to equal –0.5, which is smaller in absolute value than 1.0, and thus inelastic. Not only will elasticities vary by type of alcohol, but also within type, *e.g.*, the elasticity of fine Bordeaux wine and cheap, high alcohol wine would likely differ.

[7] For example, if the "price elasticity of demand" is –0.5, a 10% increase in price will lead to a 5% reduction in quantity demanded.

[8] For a comprehensive survey of health effects that range from beneficial to harmful, see National Institute on Alcohol Abuse and Alcoholism (2000). See also Cook and Moore (2000).

regulate. Drinking and problem drinking have many facets. Drinking problems can be acute, arising from a single episode of abuse, such as those due to drunk driving, cardiac arrythmia, violence, and sexual aggression. There are chronic problems that manifest themselves only after a lifetime of drinking, such as liver cirrhosis, some cancers, interactions with tobacco use, and cardiovascular disease. Fetal alcohol syndrome and low birthweight can result from both chronic and acute abuse. The economics and public health literatures are very clear in finding that most of the costs of alcohol abuse are due to acute abuse.[9] Thus, most economists would argue that acute abuse should be the relevant focus of alcohol policy.

13. Finally, a fundamental tenet of economics is that, when governments intervene into markets, there will be efficiency and fairness implications, because these interventions change prices, and thus change incentives and behaviors.[10] Efficiency can be enhanced or hindered by a regulatory intervention.[11] Fairness considerations result because the interventions invariably will transfer wealth from some groups to others.[12] The design of the regulation matters too: different regulations with an identical effect on average prices can yield very different outcomes in terms of fairness, efficiency, and consumption.[13]

II. Principal Conclusions

14. No evidence has been presented in this case indicating that the challenged regulations reduce abusive consumption. The data analysis offered by Professor Chaloupka does not provide much insight regarding this point. I am aware of nothing in the published literature that establishes a link between regulations of

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[9] Manning, *et al.,* (1989) and Kenkel (1996). Cook and Moore (2000) p. 1646, cite data showing that 80% of premature mortality due to alcohol abuse results from acute rather than chronic abuse.

[10] Note the parallel here to the language in Revised Code of Washington (2005) Section 66.28.180, ¶1.

[11] Externality problems, such as pollution, may be amenable to solution by regulation, such as the Environmental Protection Agency's Acid Rain Program. It is important to note that the design of the regulation is critical, and that many economists claim (with good reason) that some regulations have created inefficiencies. Stigler (1971).

[12] For example, import restrictions might benefit domestic producers and their employees, while harming offshore producers and their employees. In the present matter, the price restrictions harm those who would purchase from low cost retailers in the absence of the restrictions. The incidence of the benefits is unclear. These would most likely be shared by distributors, high cost retailers, and those who purchase from high cost retailers when the restrictions are in place.

[13] One source of differences is a feedback or general equilibrium effect, in the jargon of economics. This relates to all of the changes that occur in all markets when the price and quantity consumed of a single market good change. For example, Prohibition raised the price of legal alcohol (essentially to infinity), with legal consumption falling to zero. In response, illegal alcohol production ensued, at a price somewhere below infinity. Criminal activity increased, "speakeasies" appeared, and total alcohol consumption was not reduced to zero.

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this type and alcohol abuse.[14] Any claim that the challenged regulations moderate alcohol abuse therefore lacks empirical support.

15. The literature is also inconclusive as to whether price increases can affect abuse. While several articles cited by the Defense experts are supportive of this claim, several others indicate that there may be no effect.[15]

16. The challenged regulations are inefficient because they focus on all drinking, rather than problem drinking.[16] Price represents a blunt instrument that penalizes consumers while seeking to regulate abuse. The emergence of recent evidence that price might not matter further emphasizes this point.[17]

17. If fairness is a goal of the challenged regulations, policies directed at acute abuse rather than all drinking are fairer than broad price increases.[18] According to my calculations, the challenged regulations impose an implicit tax on drinkers in Washington of approximately $100 million a year in lost consumer surplus for every 5% increase in price.[19] If prices are 10% higher or greater, as Professor Chaloupka suggests, the costs to normal consumers are proportionally larger.[20]

18. If reduced abuse is a goal, this goal is achieved more effectively via targeted interventions that either raise the expected costs of abuse, e.g., by increasing penalties for drunk driving or stricter enforcement of the laws, or that reduce the demand for abuse, e.g., through alcohol education programs.

19. Defendants' analysis of price effects is also incomplete. In one part of their analysis, defense experts cite the role of higher prices under the challenged regulations in promoting temperance and the public health. Elsewhere, they offer that the challenged regulations lead to lower prices for high cost sellers, such as convenience stores, and higher prices for low cost sellers, such as large retailers.[21] While it is certainly possible that such price shifts could yield higher *average* prices, it is also possible that the lower prices at small outlets could, under defendants' theory, lead to increased abuse.

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[14] In fact, Defense Expert Frank J. Chaloupka states that "…there are, to my knowledge, no published studies on the impact of the types of policies at issue in this case on these outcomes [of drinking and its consequences]." Expert Report of Frank J. Chaloupka (2005) ¶43.

[15] Manning, *et al.* (1995), Kenkel (1996), Dee (1999), Dee and Evans (2001), and Cook and Moore (2001).

[16] See Kenkel (1996) p. 314, who characterizes optimal taxation of alcohol beverages as a "second-best" solution to the problem of controlling problem drinking. Kenkel suggests increased health awareness and stiffer fines and penalties for abusive drinking as the first-best solution. See also Cook and Moore (2000).

[17] Manning, *et al.* (1995), Kenkel (1996), Dee (1999), Dee and Evans (2001), and Cook and Moore (2001).

[18] For issues of fairness as they relate to alcohol excise taxation, see Cook and Moore (2000) pp. 1658-1665.

[19] Consumer surplus is the standard economic measure of the dollar value of benefits derived from consumption.

[20] Expert Report of Frank J. Chaloupka (2005) ¶27.

[21] Expert Report of William J. Rorabaugh (2005) ¶19 and Expert Report of Kenneth L. Casavant (2005) ¶13.

20. Defense experts ignore the implications of this subsidy to high cost retail outlets. Because small outlets are subsidized by the challenged regulations, consumption at these outlets will be higher than in the but-for world. If this consumption leads to increases in acute abuse, the challenged regulations could be adversely affecting the public health.

21. The potential problems created by subsidizing prices for small retailers, and therefore stimulating consumption in these outlets, are compounded by the possibility that the challenged regulations create incentives to engage in non-price competition. In particular, if distributors are enriched by a regulation that causes a higher average price, they will use this windfall profit to compete for increased business. Non-price tactics, which could include competitive tools like advertising and services to retailers, also tend to increase consumption. Under Defendants' theory, if this entails greater abuse, this effect works counter to that of a higher average price.

22. If the state wishes to use average price as a policy instrument, and if higher average prices do lead to less abuse, this result would be achieved more effectively by an excise tax increase than by the challenged regulations. An excise tax increase would increase *all* retail prices, not just those of large retailers, and bring the average price up along with them. There would be no subsidy to high cost outlets, and therefore no subsidized increase in consumption through these outlets.[22] With excise taxes in place of the challenged restrictions, the State could use the proceeds from the tax to fund expansions of its existing enforcement efforts and to promote expansions in its alcohol education and other health oriented programs, without raising the average price any further. Initiatives such as these would serve to reinforce the effects of the price increase, rather than subvert them. As an aside, this should raise a cautionary flag against using the results of tax studies to infer effects of the challenged regulations.

23. Professor Chaloupka does not present convincing empirical evidence of the effects of the challenged regulations. His regression analyses of deregulations in Nebraska and Delaware are flawed and therefore uninformative. He ignores evidence from California that contradicts his conclusions. Professor Chaloupka appears to assume that all prices are higher under the challenged regulations. He also fails to consider the distributional consequences and unintended consequences of the challenged regulations, including the incentives that they create for non-price competition and the costs that they impose upon normal drinkers in Washington.

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[22] There would still be a relative price change that favored the high price outlets, if the excise tax is a unit tax. For example, if a six-pack of beer costs $5 in a convenience store, and $4 in a warehouse, the relative price is 1.25. If a tax of $1 per six-pack were imposed on both, the relative price would fall to 1.20.

III. Analysis

24. A fundamental element of Defendants' support for the challenged regulations is the claim that the system raises the average price of alcohol beverages to consumers. In Defendants' theory, this higher price acts very much like an excise tax, and the literature on the effects of excise taxes on abuse is then cited as proof that the system helps to control abuse.

25. There are at least four problems with this line of reasoning.

    a. First, if wholesale prices are higher on average it does not necessarily follow that all wholesale prices are higher, nor does it imply that they are all higher at retail.
    b. Second, higher average prices attempt to achieve the alleged reduction in abuse at a significant cost to non-abusive consumers.
    c. Third, higher average prices have distributional consequences that turn on the design of the regulatory policy.
    d. Fourth, the literature on the effects of price on abuse, upon which Defendants rely, is inconclusive.

A. ALL RETAIL PRICES ARE NOT NECESSARILY HIGHER UNDER THE CHALLENGED REGULATIONS

26. Regarding the first point, compare the following statements:

    a. All ethanol prices go up by 25 cents per ounce.
    b. Average price of ethanol goes up by 25 cents per ounce.

27. While (a) necessarily implies (b), (b) does not imply (a). If some retail prices are higher and others lower under the challenged regulations, then an evaluation of their effects must balance the effects of increased consumption where retail prices are lower against those of decreased consumption where retail prices are higher. This would require knowledge of the extent to which abusive consumption results from increased purchases in the subsidized outlets. For example, if underage youths are more likely to attempt to buy fortified wine at convenience stores than at large retailers, then a policy that subsidizes fortified wine prices at convenience stores would promote youthful abuse.

B. COSTS OF THE CHALLENGED REGULATIONS TO NON-ABUSERS

28. A thorough understanding of the effects of the challenged regulations must examine the *economic incidence* of the higher average price.[23] Incidence analysis

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[23] Economic incidence examines the effects of an increase in an input price on all segments of the market: producers, consumers, middlemen, workers, and so forth, once all prices have adjusted to a new equilibrium. See, for example, Kotlikoff and Summers (1987), or Atkinson and Stiglitz (1980).

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allows me to estimate the effects of hypothetical price increases on consumer welfare, given estimates of demand elasticities and consumption levels. These data are readily available in this case.[24] According to my calculations, a 5% increase in prices of beer and wine would, on net, reduce consumer surplus on alcohol consumption in Washington by approximately $100 million per year.[25] Exhibit 5 illustrates the nature of the calculations, Exhibit 6 summarizes estimates of welfare loss and transfers by beverage category, and Exhibit 7 provides a graphical illustration.[26]

29. While the actual effect of the challenged regulations on average prices is not known precisely, evidence on the record in this case suggests that 5% is a conservative estimate. Plaintiff's expert Professor Keith Lefler, for example, shows that prices paid by Costco in Washington are higher than in California for a large number of beverage products.[27] Professor Chaloupka suggests more anecdotally that prices for several wines sold through Costco in Washington and California differ by approximately 10-24% in price.[28] My calculations are thus consistent with the evidence presented by both sides.[29]

30. There are ways to regulate and reduce abuse that are more effective than the challenged regulations. Regarding youthful drinking and habituation, minimum purchase age restrictions are considerably more effective than price increases.[30] Similarly, increased minimum purchase ages, more stringent blood-alcohol content laws, experience-rated insurance pricing, dram shop liability rules, more severe penalties, and more stringent enforcement reduce drunk driving without penalizing normal consumers.[31] Servers who have undergone training are less likely to serve inebriated customers.[32] Community based education programs have been shown to have an effect on youths who have not yet started using alcohol.[33] Washington already has many such policies in place. An increase in the State's efforts here could achieve further reductions in abuse without the lost consumer surplus to normal drinkers caused by the challenged regulations.

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[24] Various experts in this case cite the estimates reported by Leung and Phelps (1993) as consensus estimates. I will use these estimates and publicly available consumption data in my calculations.

[25] There would be an additional transfer from consumers to the state if distilled spirit prices are bid up due to cross-substitution effects. That is, if the challenged regulations make beer and wine more expensive, the demand for distilled spirits will increase, as will its price.

[26] Note the sensitivity of the transfer amounts to the demand elasticity, illustrating the basic principle that less elastic the demand for the taxed commodity will yield greater tax revenues.

[27] Expert Report of Keith Lefler (2005) ¶24-26.

[28] If we take Professor Chaloupka's estimates of the price increases caused by the challenged regulations at face value (Expert Report of Frank J. Chaloupka (2005) ¶23 and ¶27), this would imply that the challenged regulations impose an implicit tax on consumers in Washington of over $200 million annually.

[29] Despite this consistency, without further study the calculations that I present are best interpreted as hypothetical and illustrative examples, albeit with some basis in fact.

[30] In Cook and Moore (2001) p. 421, we show that drinking and abusive drinking by youths respond to increases in the minimum purchase age, while the evidence that abusive youthful drinking responds to excise tax increases is mixed.

[31] Kenkel (1996) or National Institute on Alcohol Abuse and Alcoholism (2000).

[32] McKnight and Streff (1994).

[33] Perry, et al. (1996).

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C. DISTRIBUTIONAL ISSUES

31. Regarding ¶25(c) of this report, the proceeds from higher average prices must be going somewhere. One plausible outcome, and one that Defendants' experts appear to endorse, is that those retailers that would be relatively inexpensive to service in the but-for world (low cost retailers, such as Costco) will pay more to distributors, while those that would be relatively expensive to service in the but-for world (high cost retailers, such as convenience stores) will pay less than they would if distributors were allowed to price discriminate on the basis of cost.[34]

32. In the actual world, some portion of the losses due to higher prices could be passed on to consumers of the low cost retailers, while some portion of the savings due to the lower prices could be passed on to the consumers of the high cost retailers.[35] In this event, the challenged regulations transfer wealth from those consumers who would buy from the low cost retailers in the but-for world to those who do buy from the high cost retailers in the actual world. Some portion of the proceeds from the higher average price could also accrue to distributors and to high cost retailers, such as convenience stores, bars, and restaurants.

33. If the challenged regulations transfer wealth from low cost retailers and their customers to high cost retailers and their distributors, the wealth transfer could lead to increased non-price competition by distributors and high cost retailers.[36] This increased competition, both cost reducing and demand enhancing, will tend to offset the direct effects of any price increase on alcohol consumption.[37] In Exhibit 7, this effect would be illustrated by shifting the demand curve out to the right. The new equilibrium would have higher consumption than would be expected in the absence of the non-price competition.

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[34]Expert Report of William J. Rorabaugh (2005) ¶19 and ¶22, and Expert Report of Kenneth L. Casavant (2005) ¶13.

[35] The amount of the pass-on will depend upon elasticities of supply and demand in the relevant markets. In perfectly competitive markets, price changes will be passed on to consumers in their entirety. If prices cannot fall due to regulatory restrictions, the pass-on could come via non-price competition. In my own research with Philip Cook, I argue that excise tax increases are likely passed on to consumers in their entirety or perhaps even in excess of the amount of the tax (Cook and Moore (2000)). The amount of the pass-on depends on specifics of market structure in complicated ways. Whether this result applies to pass-on effects of the challenged regulations is unclear.

[36]Expert Report of Kenneth Casavant (2005) ¶17, lists many services potentially provided to retailers, including stock rotation, experimental marketing, and offering greater varieties. Under current regulations in Washington, distributors are allowed to rotate their retailers' stock, replenish inventories, and rearrange stock on shelves, and also to provide promotional materials such as point of sale displays, brand advertising, and brand signs. See Washington State Liquor Control Board (2003).

[37] Cost reducing activities include rotating, rearranging and replenishing inventory. Demand enhancing activities include brand signs, and point of sale material such as display bins and product information pamphlets.

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34. To the extent that the implicit subsidy to small retailers increases the density of convenience stores selling beer and wine, access to alcohol will be greater.[38] As Professor Casavant notes, time costs are an important component of demand.[39] Greater outlet density could lower the time costs of acquisition, and therefore increase alcohol consumption, again working to offset the effects of the price increase. A related question, not addressed by Professor Chaloupka, is whether acute abusers are more likely to purchase alcohol beverages at high cost retail outlets, such as convenience stores, than at low cost retailers.

35. It is useful to contrast the effects of the challenged regulations with alternatives. Two major competing alternatives are an excise tax, which would seek to regulate abuse by raising all prices, and targeted efforts to control abuse, such as fines and penalties for drunk driving and alcohol education projects, all of which would seek to regulate abuse without raising prices to non-abusers.

36. An excise tax that is equivalent to the challenged regulations in terms of its effect on the aggregate quantity consumed and on average prices would raise prices at all retail outlets, rather than lower them in some places and raise them in others. The question of whether subsidies to high cost outlets lead to increased abuse would then be moot.

37. An excise tax would transfer wealth to the state, rather than to distributors, high cost retailers, and their customers. It would not create incentives for non-price competition, as the distributors and retailers would not have any economic rents to dissipate. To the extent the tax revenues could be used for increased enforcement and targeted alcohol education programs, the direct and indirect effects of the price increase would be complementary.[40]

38. Limiting cases are useful for understanding maximum potential impacts. If the $100 million transfer goes entirely to distributors with no downstream price pass-on to retailers or consumers, the distributors then have those funds available for non-price promotions or to increase their own profits.[41] If the distributors spend 20% of this windfall on marketing efforts, this would entail an additional $20 million per year in marketing expenditures. As a result of these increased promotions, alcohol consumption could be higher, and could therefore diminish

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[38] There is little evidence of the effects of regulations such as this on outlet density. Washington does not limit the number of licenses to distribute beer and wine, and licenses currently cost $100 for beer and wine specialty shops, $150 for grocery stores, and $200 for beer and/or wine for bars and restaurants that do not serve spirits (Washington State Liquor Control Board (2005)). A convenience store with $100,000 in annual alcohol beverage sales would receive $5,000-$10,000 in additional revenues, with no increase in costs, if the challenged regulations raised prices by 10%. If beer and wine sales equal 30% of revenues, this would amount to increased profitability of up to 3%. A complete understanding of this part of the problem would require knowledge of the effects of convenience and access on acute abuse. I am not aware of any literature on this.

[39] Expert Report of Kenneth L. Casavant (2005) ¶16.

[40] Kenkel (1996).

[41] Stigler (1968), Posner (1975), and Fisher (1985).

the effects of the price increase. Any portion of the transfer passed on to retailers would subsidize small outlets, leading to increased competition among retailers. If the competition results in a lower price, consumption will increase. If it results in increased promotional efforts, consumption will again increase.

39. If the $100 million were collected as an excise tax that preserved aggregate quantities and average prices, and these proceeds were applied to alcohol education projects and to increased enforcement, the reductions in problem drinking could be substantial.[42] To get a sense of the order of magnitude of this transfer, the Washington State Liquor Control Board collected over $217 million in alcohol excise taxes in fiscal year 2002.[43] A baseline estimate for marketing spending on beverage alcohol in Washington for 2002 is approximately $150 million.[44]

40. Targeted efforts to reduce abuse present the best control policy. Unlike a tax, they do not raise prices to normal drinkers, thus they will be more politically acceptable. Unlike the challenged regulations, they do not create conflicting results by lowering prices in some outlets and by stimulating non-price competition. Evidence in Washington indicates that such targeted programs work: the Seattle and Tacoma Alcohol Impact Area projects have met with success.[45] The literature is clear that other targeted interventions, such as limits on happy hours on campus, increased enforcement, increased liability, and better health information, work.[46]

D. EVIDENCE ON THE EFFECTS OF PRICE ON ABUSE IS INCONCLUSIVE

41. In Cook and Moore (2000), we note

> Important econometric challenges remain, including the search for a satisfactory resolution to the conflicting results on the effect of price changes on consumption by consumers who tend to drink heavily.[47]

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[42] Gifford (2002) provides figures that allow the computation of the cost of the average police officer in the state of Washington, which was approximately $70,000/year in 1999. In the extreme, assuming $75,000 per police officer, an additional $100 million in tax revenues would mean an additional 1,333 police officers.

[43] Washington State Liquor Control Board (2002) p. 11.

[44] Spending on measured media, which primarily consists of television, radio, print, and billboards, for alcohol advertising in the United States totaled $1.9 billion in 2002 (Center on Alcohol Marketing and Youth (2003)). Unmeasured media, which includes internet advertising, sponsorships, and promotional items such as free beach chairs and point of purchase coolers, was estimated to total $3 for each $1 of measured media (Federal Trade Commission (1999)). While alcohol advertising expenditure data for Washington are not available, approximately 2% of alcohol in the United States is sold in Washington. If I assume that alcohol promotional expenditures in Washington equal 2% of alcohol promotional spending in the U.S. for 2002, Washington's share would be approximately $150 million.

[45] See Washington State Liquor Control Board (2002) for reference to the success of the Tacoma Alcohol Impact Area.

[46] Kenkel (1996) and Ellis and Laine (2005).

[47] Cook and Moore (2000) p. 1630.

This quote reflects the recent emergence of evidence inconsistent with the earlier received view that higher average prices reduce abusive consumption and its consequences. In Cook and Moore (2001), for example, we find mixed results on the effects of excise tax increases on youthful binge drinking. Several of the statistically significant results are too large to be credible. Likewise, Dee (1999) and Dee and Evans (2001) find little or no evidence that tax increases reduce drunk driving. Manning, *et al.* (1995), in a study using individual level data, find that heavy drinking is less responsive to price than moderate drinking. Kenkel (1996) finds that price only affects heavy drinking among well-informed consumers.[48]

42. Whether this contrary evidence reflects the absence of a true effect, or limitations of the available data, is not clear. Until this issue is resolved, however, the evidence on the effects of price on abuse is best described as inconclusive.

IV. Critique of the Report of Defendants' Expert Professor Frank Chaloupka

43. To support Defendants' claim that the challenged regulations lead to higher prices in Washington, Professor Frank Chaloupka presents an empirical analysis of the effect of alcohol control policy changes in Nebraska and Delaware. Professor Chaloupka seeks to model ethanol consumption in two states that repealed control policies that are in his view similar to those at issue here. According to Professor Chaloupka, Nebraska allowed quantity discounts and eliminated price posting for wine and distilled spirits beginning in June 1984, while Delaware allowed quantity discounts for beer, wine, and distilled spirits beginning in June 1992.[49]

44. The regression results presented by Professor Chaloupka do not provide insight into the effects of changes in alcohol control policies. My opinion considers a number of factors, which I discuss below. The factors include inconsistencies in the results across beverage categories in Nebraska, limitations of the method Professor Chaloupka uses to construct the but-for predictions, failure to analyze a relevant policy change in California that suggests no effect, and nonstationarities in the data.[50]

45. To test the sensitivity of Professor Chaloupka's results to various modeling assumptions, I first attempted to replicate his results using his models and data.[51]

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[48] Kenkel (1996) p. 303, uses health knowledge questions about the awareness of the risks of drinking from the Health Promotion and Disease Prevention supplement to the 1985 Health Interview Survey.

[49] Expert Report of Frank J. Chaloupka (2005) ¶43.

[50] Part of my discussion of Professor Chaloupka's results will deal with certain technical aspects of his econometric model. As such, econometric terms will be used here in order to convey a very precise meaning. While understandably confusing to the non-econometrician, it is important to be very careful about the issues being discussed, so I will use the necessary econometric language as appropriate.

[51] These data were provided by defense counsel on June 22, 2005 as Delaware_data.xls and nebraska_data.xls. I use these data for the majority of my analyses.

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I am able to replicate his findings for Nebraska, but not for Delaware. The differences between my replication and his reported findings for Delaware are *de minimis*.

46. I will focus my comments here on Professor Chaloupka's "Model 1" estimates for Nebraska. I do so for three reasons: Delaware is a small state with potentially confounding border effects, due to Wilmington's proximity to Philadelphia. Also, the other models offered for both states (Models 2-4) raise specification issues above and beyond those in Model 1.[52] Most importantly, Nebraska presents a potentially useful policy experiment, in that the policy change there as described by Professor Chaloupka applied only to wine and distilled spirits.[53] As a result, we can examine beer consumption in Nebraska separately, and use these results as a control group to help determine whether the results for wine and spirits are supportive of his conclusions.

47. Economic theory predicts that beer consumption should fall following the policy change in Nebraska, while wine and spirits consumption should rise, holding everything else constant. My estimates, which are reported in Exhibit 8, do not support these predictions. In particular, the estimated policy-trend interaction effect in the beer equation indicates that beer consumption trend rose by 0.021 gallons per year after the policy change, while the estimated coefficient in the wine equation indicates that wine consumption trend fell by 0.007 gallons per year after the policy change. Both of these estimates are statistically significant, and are contrary to the predictions of economic theory, indicating model misspecification. Of the three estimated models, only the distilled spirits model estimates are consistent with Professor Chaloupka's results.

48. I also attempted to replicate the but-for analyses conducted by Professor Chaloupka. Best practice in the use of regression analysis for constructing but-for predictions follows a preferred format: a model is fitted in an appropriately selected estimation period, and the estimates of this model are then used to predict the but-for outcomes in the treatment period. In this before-after design, the portion of the sample drawn before the policy change would be the estimation period, and the portion of the sample drawn after the change would be the treatment period. Estimates of a model fit in the estimation period are used to predict consumption in the treatment period, but-for the policy change, allowing all other factors included in the model to change during the treatment period. The

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[52] In Models 3 and 4, for example, the tax variable is not interacted with the policy variable, while the aggregate consumption variable is. In my estimates adding the tax-policy interaction term, I find that it is statistically significant. In Models 2 and 4, the regional consumption variable is more likely to be correlated with the unobservable variables in the model than is the national consumption variable. Finally, Professor Chaloupka's motivation for the interaction terms does not make sense with respect to the aggregate consumption variable. In particular, he states that "These interaction terms are important in capturing the likelihood that the changes in policy will take some time to fully impact on consumption given that distributors and retailers will take some time to fully adjust to the new environment in which they operate." (Expert Report of Frank J. Chaloupka (2005) ¶44).

[53] Expert Report of Frank J. Chaloupka (2005) ¶43.

difference between observed and actual consumption in the treatment period is then attributed to the policy change, controlling for the effects of all of the included factors.[54]

49. Rather than take this approach, Professor Chaloupka uses the entire dataset to estimate the regression coefficients, and then predicts consumption within-sample.[55]

50. In my analysis, I constructed forecasts using the preferred approach. I separated the data into two regimes (pre- and post-policy change) and used estimates from one regime (the estimation sample) to predict consumption in the other (the treatment sample). Using data prior to the policy change as the estimation sample, I forecasted into the treatment period. If the policy change were associated with increased ethanol consumption, one would expect but-for consumption to be lower than actual consumption in the treatment period.

51. I also took the data following the policy change as my estimation period, and forecasted backwards into the pre-policy change period. If the policies in the pre-policy change period were more effective in limiting consumption, one would expect to find but-for consumption to be higher than actual in the pre-policy change period.

52. For Nebraska, the but-for analyses provide conflicting results. When I use the pre-policy change data for estimation purposes, but-for consumption in the post-policy change period is less than actual consumption, which is consistent with Professor Chaloupka's conclusions. When I use the post-policy change data for estimation, but-for consumption in the pre-policy change period is also lower than actual consumption, implying that consumption in the earlier period would have been lower with a less restrictive policy. Exhibit 9 illustrates these predictions.

53. In addition to the Nebraska and Delaware cases mentioned in Professor Chaloupka's report, California's laws on resale price maintenance and price posting for wine were invalidated by a Supreme Court ruling in March 1980.[56] I examined the California policy change in a manner consistent with Professor Chaloupka's evaluation of similar changes in Delaware and Nebraska and found

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[54] An alternative approach, which I also consider, uses the period after the policy change as the estimation period, and predicts backwards ("backcasts") into the period before the change.
[55] There is a subtle but important difference in the two approaches. The preferred approach will give unbiased estimates of the effects of the policy even if the model changes from pre- to post-policy periods. The approach taken by Professor Chaloupka will not. Professor Chaloupka's approach will only be correct in the special case where all variables not interacted with the policy dummies have the same effects in both periods. When I estimate separate models for treatment and estimation samples in Nebraska, the estimated effects of the tax variable differ, suggesting that Professor Chaloupka's within-sample predictions are biased.
[56]*California Retail Liquor Dealers Association v. Midcal Aluminum, Inc.* (1980).

no effects of the policy change.[57] For California, regression models equivalent to Professor Chaloupka's Models 1 and 3, which use U.S. consumption rather than regional consumption as a control variable, are presented in Exhibit 10 with a plot of predicted versus actual consumption for Model 1 presented in Exhibit 11.

54. A standard concern when time series data are used is that the mean of the time series process might not be constant over time (*i.e.*, it might be non-stationary).[58] This can lead to the problem of spurious regressions and to the conclusion that a significant correlation exists, when in fact it does not.[59] It is possible to test for non-stationary means and, if they exist, to correct for them.

55. One method of correcting for non-stationarity simply subtracts each observation from its previous value, and uses these differences as variable to estimate the model, after testing and confirming that the differenced data are stationary.[60] I find that the consumption and tax variables used by Professor Chaloupka are non-stationary and that differenced variables are stationary. When I estimate Professor Chaloupka's Models 1-4 for Delaware and Nebraska using differenced data I find that only one of the eight regressions results in a significant joint effect of the two policy variables (the policy indicator and its interaction with the trend variable).

56. Professor Chaloupka also presents a number of charts that he uses to support the conclusion that

> Taken together, Washington's comprehensive approach to reducing excessive drinking and its consequences that includes the policies at issue in this case has been effective in achieving this goal.[61]

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[57] Note that ethanol consumption in California constitutes over 50% of ethanol consumption in the Western region. Since California plays such a dominant role in consumption in the Western region, it would be inappropriate to use these data in the California regression due to California essentially appearing as both a right hand side and left hand side variable. Using the Midwest and Northeast regions in place of the Western region results in predicted consumption after the policy change being greater than actual consumption (implying the policy change was associated with a reduction in consumption), while using the Southern region results in predicted consumption after policy change being less than actual consumption. This sensitivity to the regional variable also illustrates why the policy change regressions are largely uninformative. The other regressions (for Delaware and Nebraska) are potentially plagued by this same problem of having their own data be part of the regional average, but the problem diminishes as the effect of an individual state becomes smaller on the overall average.

[58] A time series whose mean does not change over time is called a stationary series. See Greene (2003).

[59] Kennedy (2003) Chapter 18.

[60] First-differencing would only eliminate linear, or "first order" trends in the mean of the time series process. As Kennedy, *op cit.*, notes, there is potential for loss of information in this process. Dee (1999) pp. 294-296, provides a useful discussion of the consequences of differencing and related econometric methods in the context of evaluating alcohol control policies. An alternative to first differencing is to test the several potentially co-integrated variables and determine the number of co-integrating relationships, followed by the development of a vector error correction model (VECM).

[61] Expert Report of Frank J. Chaloupka (2005) ¶42.

I first note that it is impossible to separately identify the effects of the policies at issue from all of the other policies embodied in Washington's comprehensive approach. These other policies, as summarized by Professor Chaloupka, include "[m]onopoly control of wholesale and retail sales of distilled spirits," "[r]elatively high excise taxes," "[a] comprehensive set of state policies targeting drinking and driving," "[c]omprehensive policies and enforcement efforts to reduce youth access," and "rules allowing the implementation of 'Alcohol Impact Areas'."[62] It would also be incorrect to draw any inference from comparing alcohol-related outcomes without suitable statistical controls. However, it is my opinion that the facts as presented by Professor Chaloupka, and his conclusions based upon these facts, are misleading.

57. First, note that while sales of ethanol per capita in Washington are marginally below the national average, the inclusion of cross border imports, principally from Oregon, may actually result in consumption marginally above average in Washington.[63]

58. Professor Chaloupka presents data on alcohol related fatalities per 100,000 miles traveled and concludes that it "... shows that the alcohol-related traffic fatality rate is relatively low in Washington when compared to other states."[64] While true, it is also true that the non-alcohol related traffic fatality rate in Washington is relatively low.[65] This could be due to better road conditions, lower average speeds, more careful driving by residents, more effective traffic enforcement, and so forth. The rate of non-alcohol related fatalities can not be attributed exclusively to a strict alcohol control policy without controls for these other possible explanations. A better measure of abuse that controls for overall driving behaviors and conditions would examine the proportion of traffic fatalities that are alcohol-related. Using this measure, the opposite conclusion would be reached - Washington has an above average rate of alcohol related traffic fatalities (Exhibit 12, this report).

59. Consistent with this above average rate of alcohol related traffic fatalities, the blood alcohol content (BAC) of drivers involved in fatal traffic accidents in Washington is above the national average. In 2003, this is true for fatal accidents
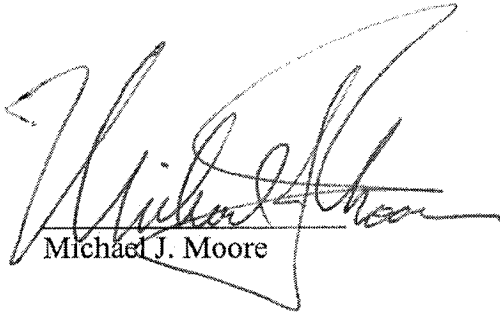
[62] Expert Report of Frank J. Chaloupka (2005) ¶41.

[63] See Fleenor (1999) pp. 9-10, who notes in a study of 1997 beer pricing that an equivalent of 5.2% of Washington beer sales are bought outside of Washington and brought into the state. He reports the lack of a sales tax in Oregon as the leading cause for these cross border purchases by consumers in Washington. Washington also is reported to sell beer to individuals within its borders that is taken across the border to Canada. The net effect of these beer imports and exports in Washington was estimated to be 2.7% of sales. If this net effect is similar for spirits and wine, average consumption in Washington for 2002 would be marginally above the national average. If the net effect of 2.7% only affects beer, Washington would remain marginally below average in 2002. See Lakins, et al. (2004) p. 16, for apparent consumption in Washington before the effect of cross border imports.

[64] Expert Report of Frank Chaloupka, ¶42 and Figure 8.

[65] National Highway Traffic Safety Administration, Fatal Analysis Reporting System (2005).

involving drivers with any measured alcohol (BAC $\geq$ .01) and for drivers with higher BAC (measured as BAC $\geq$ 0.08).[66]

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July 1, 2005
Date

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[66] National Highway Traffic Safety Administration, Fatal Analysis Reporting System (2005).